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Offshore Windparks – Planning, Construction and Future Developments

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2011.08.23 – INFORSE-Europe Sustainable Energy Seminar 2011

Security class: Open/public information

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Vattenfall at a glance (1)

Overall:

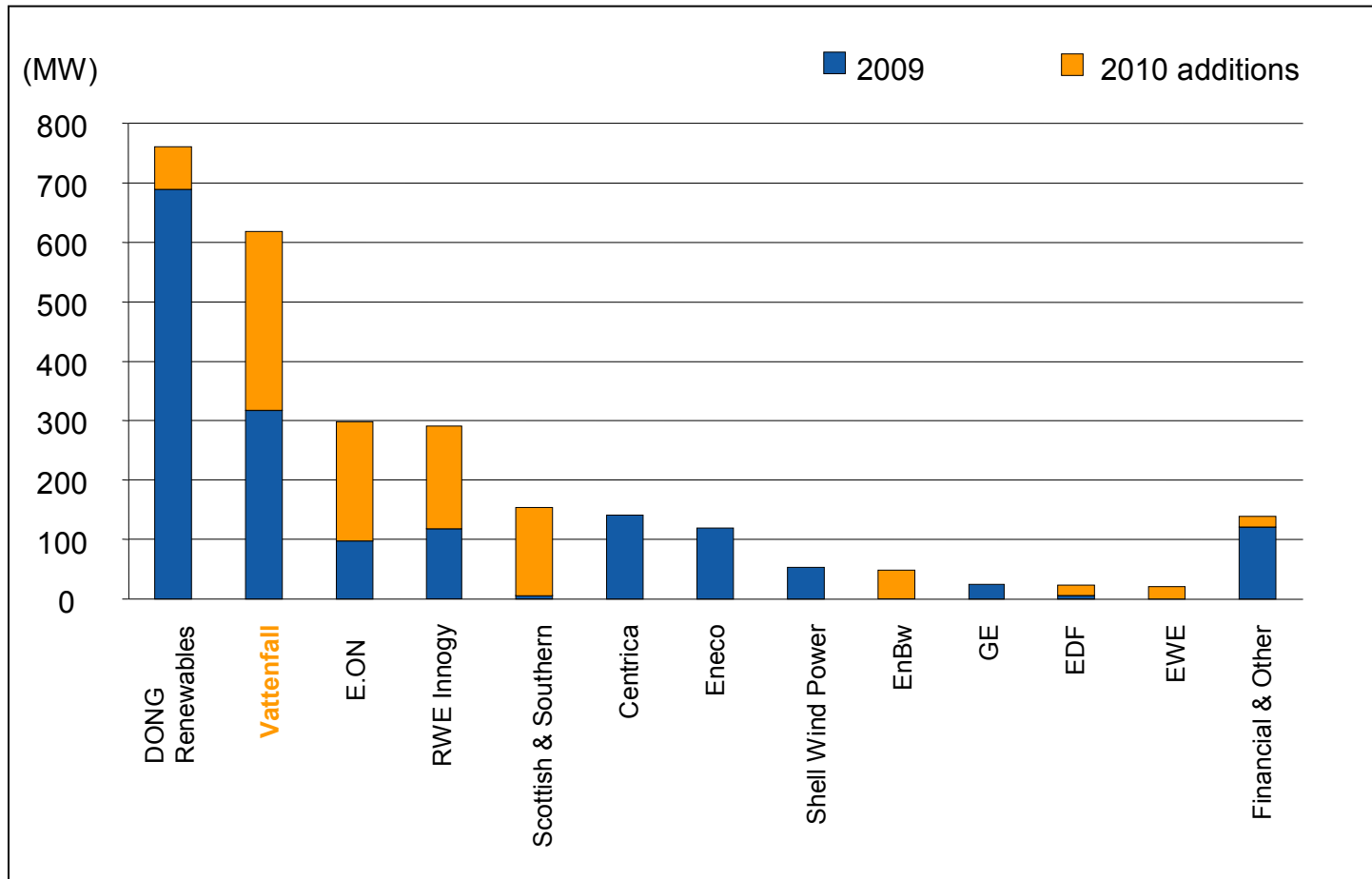
- Europe's fifth largest generator of electricity and the largest producer of heat
- Operations in Sweden, Finland, Denmark, Germany, Poland, the Netherlands, Belgium and the UK
- Core markets: Sweden, Germany and the Netherlands
- 40,000 employees total
- Vattenfall AB is wholly owned by the Swedish state

Vattenfall at a glance (2)

Wind Energy:

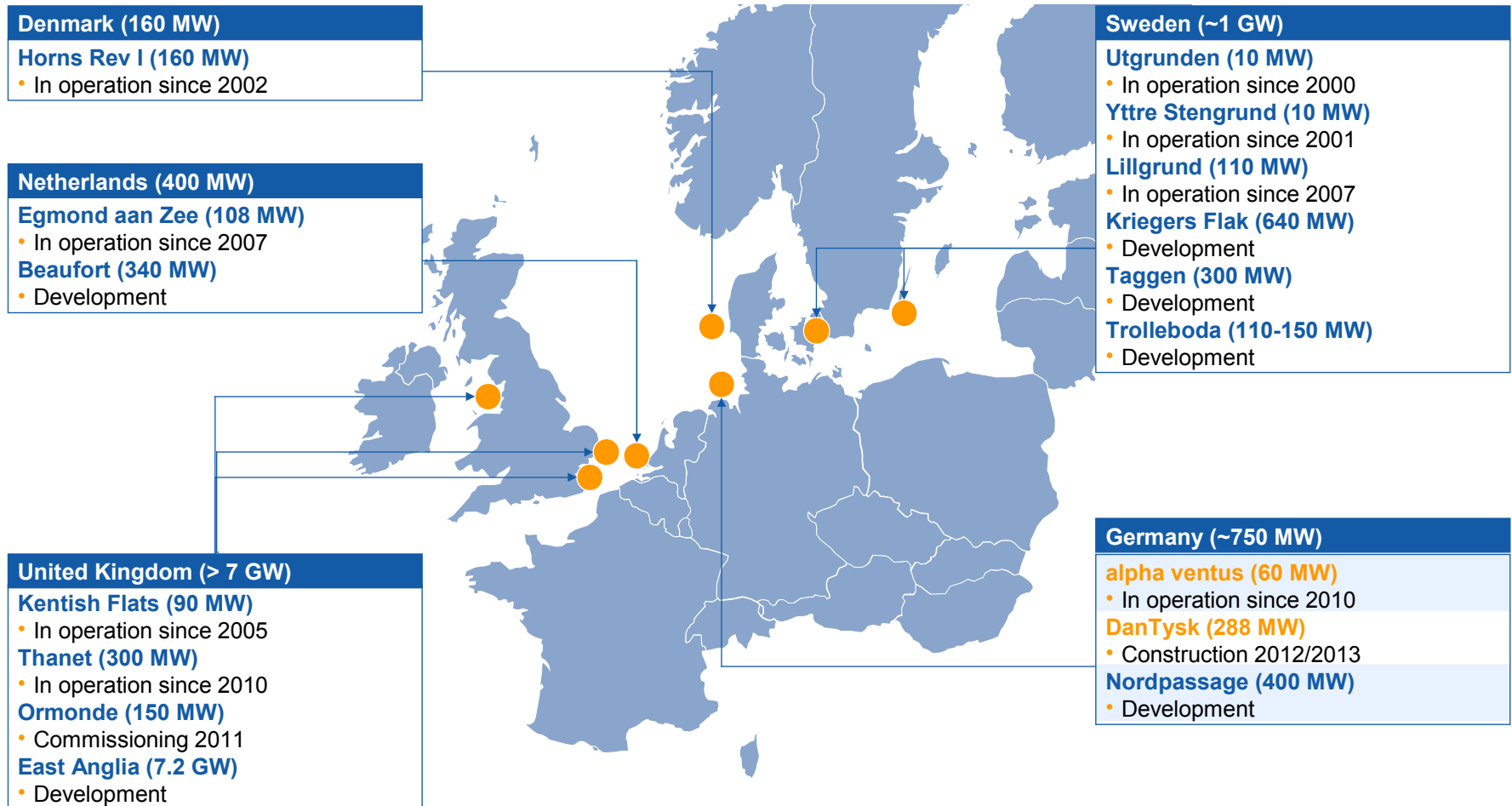
- Vattenfall Wind Power operates abt. 900 WTG onshore and offshore with installed rated power of:
 - abt. 600 MW onshore
 - abt. 690 MW offshore
- Annual production from wind energy by Vattenfall abt. 3.8 TWh
→ electricity for abt. 1 million households
- With a total of eight offshore wind farms in five countries Vattenfall is the second largest offshore wind farm operator in the world.
- Planned investments in wind energy (2011-2015): abt. 3 Mrd. €
- Employees at Vattenfall Wind Power: 262, of which 35 in Germany
(Status 05/2011)

Vattenfall Offshore Wind Power Marketshare 2009-2010



Source: Emerging Energy Technology December 2009

Vattenfall AB: Offshore Wind Portfolio



THANET – largest Offshore Windpark of the World

Facts

Total capacity	300 MW (100 Vestas V90 with 3 MW)
Annual production	974 GWh/year
Site	12km of Fomess-Point, Kent



Thanet (UTH) Park Performance Report

January 2011



Thanet

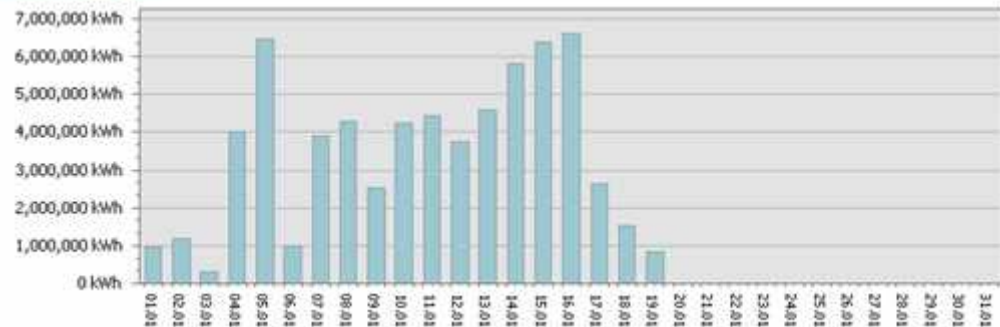
Production	Wind Average	Capacity Factor	Total Availability			Turbine Availability		
			Time Based	Energy Based	Lost Production	Time Based	Energy Based	Lost Production
65,510,859 kWh	9.4 m/s	47.89%	96.6%	96.6%	2,276,034 kWh	96.6%	96.6%	2,276,034 kWh

Expected Stops: 0
334 uncategorized stops

Service or Failure Stops: 25

Hours On Grid: ?

Hours Off Grid: 1547.3

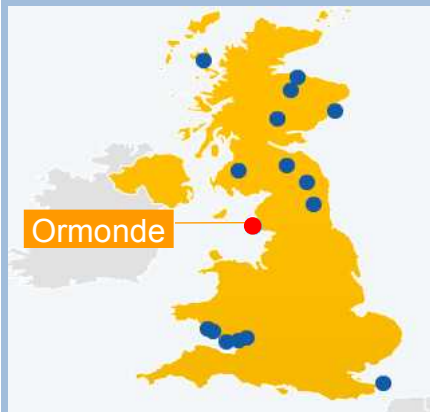


ORMONDE – Commissioning 2011

Facts

Total capacity	150 MW
Annual production	508 GWh/year
Number of supplied households	around 100.000*
Number of turbines	30 REpower turbines à 5 MW
Commissioning	End 2011

Site 10 km off the Coast, in the Irish Sea



- Multicontracting:
 - **REpower Systems:** 30 x 5MW turbines
 - **BiFab:** foundation
 - **Areva:** cable



The final and 30th. turbine was installed at 1st August 2011.

*by an average consumption of 4.478 kWh/year of British households



- Area: 71 km²
- Water depth: 21-31 m
- Investment: > 1 Mrd. €
- 80 Siemens 3,6 MW (120m Rotor) Turbines
- WEA Installation Vessel: Pacific Osprey - Swire Blue Ocean
- Jacket/Topside-Substation by Strukton/Hollandia
- Construction: End 2012 – 2013
- Commissioning: 2014
- Joint Venture with Stadtwerke München (SWM have share of 49%)

Offshore-News: Vattenfall setzt für DanTysk auf riesiges Installationsschiff



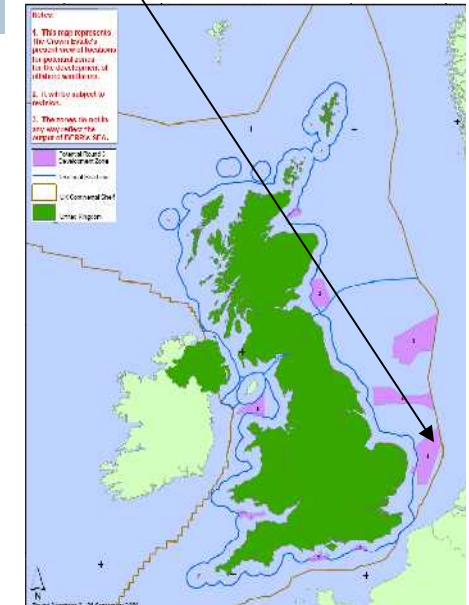
Für ihr gemeinsames Offshore-Windparkprojekt DanTysk in der Nordsee vor Sylt haben Vattenfall und die Stadtwerke München (SWM) einen weiteren entscheidenden Schritt zur Bauvorbereitung realisiert. Am 17. Februar 2011 wurde der Vertrag mit der

danischen Reederei Swire Blue Ocean (SBO) über die Nutzung eines Installationsschiffes zum Transport und zur Errichtung der 80 Siemens-Windkraftanlagen unterzeichnet. SBO hat die Samsung-Werft in Südkorea mit dem Bau des weltgrößten Installationsschiffes für Offshore-Windparks beauftragt. Erst kürzlich hatte der Übertragungsnetzbetreiber TenneT den unbedingten Netzanschluss für DanTysk zugesagt.

UK Round 3: Norfolk Bank Zone/ East Anglia Array

East Anglia Array/ Norfolk Bank Zone

Total capacity	up to 7,200 MW
UK Round III	Licence for development of area awarded to East Anglia Offshore Wind Ltd, a Joint-Venture of Vattenfall AB 50% and Scottish Power Renewables
Site	Englische Ostküste; 14km Küstenentfernung min.
Area	~ 6,000 km ²
Begin construction	on parts of area starting 2015

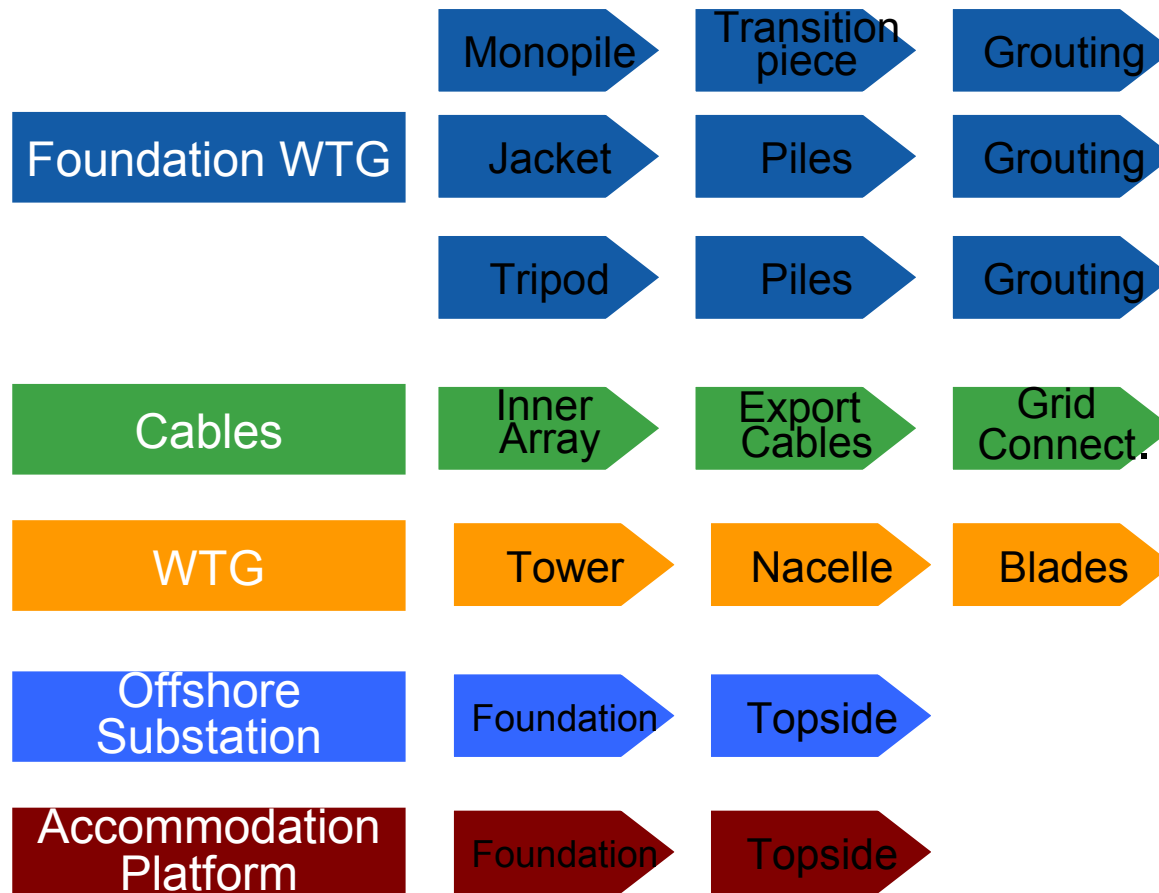


Planning Process Offshore Windparks (e.g.)

- **Site investigation** and monitoring:
soil / wind / wave / current / environmental / bombs / wrecks / archeolog.
- **Permit** for construction and operation
- Onshore **grid connection** (in Germany: including export cable)
- **Contracts** for supply of components (WTG, foundation, array cables, substation(s), accommodation platform, export cable)
- Ensuring sufficient **capacities** of:
 - Installation vessels
 - Manufacturing sites
 - Port facilities / Storage facilities
- Final **investment** decision (FID)
- Development of optimal **construction schedule**
- **Design** of all components including interfaces
- **Planning** of construction management, quality control as well as HSSE procedures (Health, Safety, Security and Environment)

Construction Process Offshore Windparks

- Components to be installed:



Offshore Windenergie – Challenge und Chances



Wer den Hafen nicht kennt, in den er segeln will, für den ist kein Wind der richtige.

(Seneca)

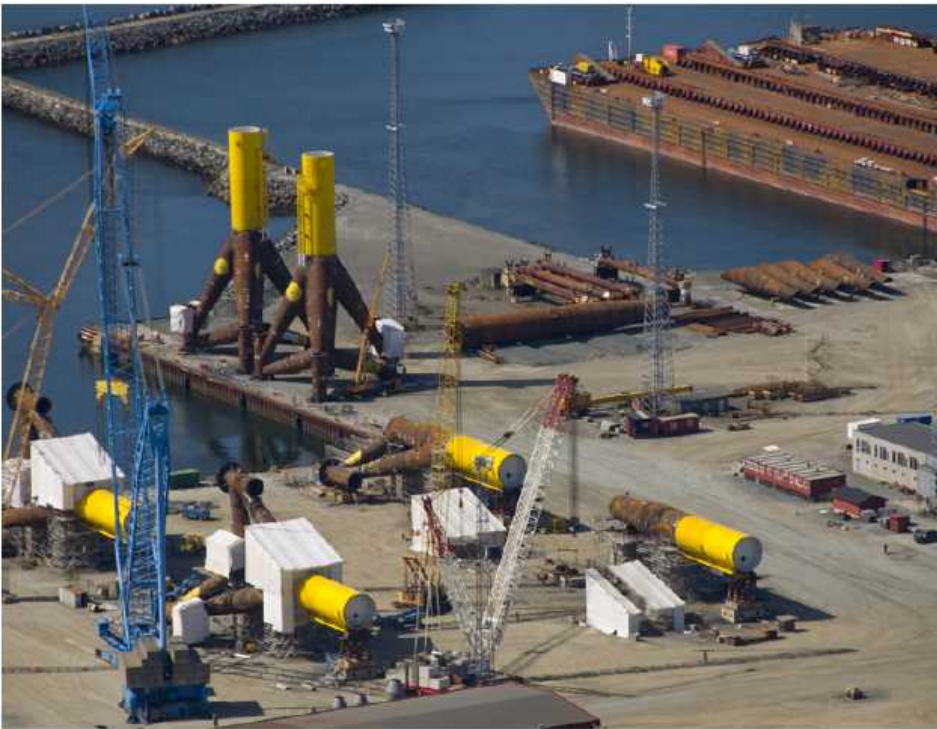
Impression: Port Locations (2010 / 2011)



Impressions: Installation Foundation (2011)



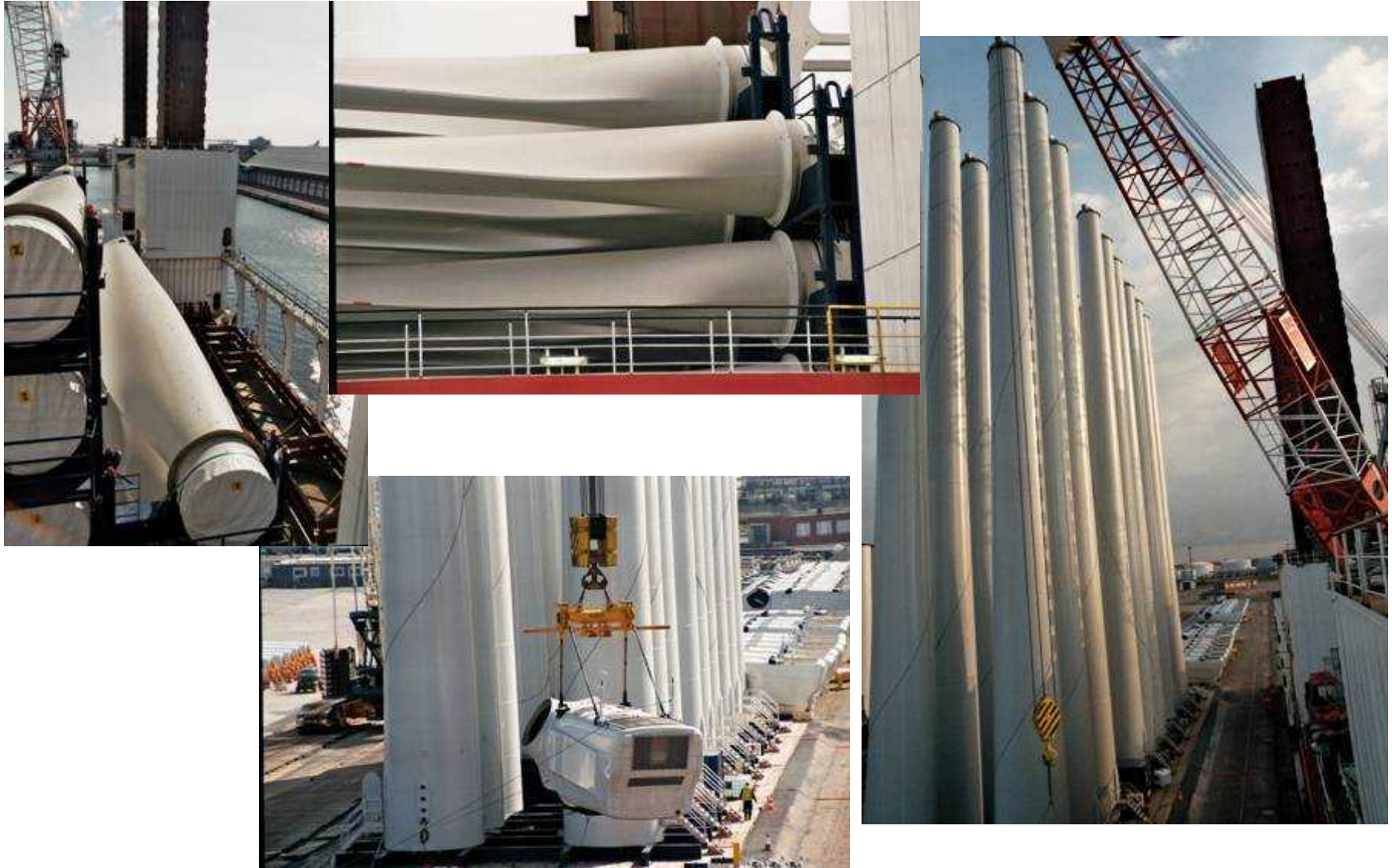
Impressions: Tripods (2009)



Impressions: Array Cable Installation (2010)



Impressions: WTG Components (2010)



Impressions: Transport WTG to the Offshore Site (2009)



15. Juli 2009: 1. Offshore-Turbine in Germany installed



Impressions: Offshore Substation (2008)



Impression: Offshore Wind Farm with Substation



Future Development Offshore Wind Energy (Politics)

- **Germany***:
 - In 2010 → 16.8 % renewable energy share of electricity consump.
 - Plan 2020 → reduce electricity consumption from currently abt. 600 TWh to 560 TWh
→ 35 % renewables energy share of electricity consumption
 - Plan 2030 → 10 GW installed capacity offshore wind energy
→ 6 % share of electricity consumption
(one offshore windpark with 400 MW can produce abt. 1,500 GWh electricity)
- **EU – 27****:
 - In 2009 → 18 % renewable energy share in electricity consumption
 - Plan 2020 → 20 % renewable energy share

* source: Background information on development of renewable energy in Germany, Fed. Gov. Germany, May 2011

** source: Study by EURO Observer, 2010

Future Development Offshore Wind Energy (Technology)

- “Industrialization” of installation process
 - Installation vessels with large capacities
 - Suitable ports with sufficient storage capacities
 - Qualified personnel
- Sufficient manufacturing capacities
- Low maintenance and durable components (WTG, equipment)
- Improvements in accessibility of locations in wind farms during operation
- Reduce costs during manufacturing, construction and operation

Offshore Wind Energy

- Offshore wind is and will be an important renewable energy source with significantly increasing share in the future
- Improve efficient reduction in energy consumption
- Conduct further investments in all other renewable energy sources
- Focus on sustainable energy future

→ Let us join forces!

A photograph of an offshore wind farm at sunset. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the water. Several wind turbines are silhouetted against the sky, which is filled with soft, wispy clouds. The overall mood is serene and peaceful.

Thank you!

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